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DEGRADATION OF HAWK ASSAULT FIRE UNIT (AFU) OPERATING IN A CHEMICAL ENVIRONMENT

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Performance degradation resulting from the wearing of individual protective equipment (IPE) was quantified and the resulting correction factors determined for a HAWK Assault Fire Unit. When multiplied by the time to perform the task in Battle Dress Uniform, these factors provide a time estimate and most probable range for the time to perform a similar task while wearing IPE. All tasks were completed with results indicating little personnel degradation caused by the IPE. Correction factors ranged from 1.1 to 1.5 for fifteen HAWK unit tasks.

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1. INTRODUCTION

1.1. Background. Troop performance degradation due to chemical protective equipment has been of increasing concern to military commanders. This protective equipment is worn in one of four configurations referred to as Mission Oriented Protective Posture (MOPP) levels. MOPPIV posture, during which all equipment is worn and sealed, is the most protective and the most bulky, cumbersome and restrictive mode. Personnel are protected at the expense of their encumbrance, a circumstance which results from impeded physiological functions including vision, hearing, speaking, manual dexterity and others. This encumbrance produces degradation in the form of (usually) increased time to complete tasks and in some cases reduced accuracy. In order that these degradations might be quantified for use in simulations, war gaming, and other studies of unit effectiveness and combat readiness, field studies are deemed necessary since laboratory exercises typically introduce artifacts that can bias results.

A portion of an extensive DoD-sponsored and Dugway Proving Ground-(DPG) administered program, referred to as DO-49, was implemented to satisfy the required need for field testing and to quantify the effect of wearing MOPPIV on personnel performing military tasks. The program included five specific operational areas in cold, moderate and hot temperatures; Maintenance, Armor, Signal, Missile and Night Reconnaisance.

The Vulnerability/Lethality Division of the Ballistic Research Laboratory (BRL) has an extensive ongoing program for estimating the vulnerability of military systems on the integrated battlefield to include the effects of conventional, nuclear, and chemical munitions on the effectiveness of various units. The model for this program is the Army Unit Resiliency Analysis (AURA) methodology.[1] AURA utilizes inputs from several areas that impact on the ability of a unit to accomplish a mission, which includes the effect of wearing MOPPIV. Since degradation data have generally not been available for many skill areas and because of the need to include degradation performance in unit effectiveness studies using AURA, the BRL developed an algorithm to estimate personnel degradation due to MOPPIV. In this report, MOPPIV refers to wearing all individual productive equipment and MOPPIV time, the time required to complete a task while wearing level IV.

One major concern in interpreting field data is the need to establish a degradation value. It is not unusual to find judgments made on the effect of protective equipment with no real estimate of the effect or the variation experienced. One purpose of this effort is to provide a numerical estimate of the equipment effect and the associated variation.

This report presents the results of Missile Operations conducted in a moderate environment with temperatures ranging between 60° and 85° with low humidity at the Yuma Marine Corps Air Station in Yuma, Arizona, from 4 March through 14 March 1985.

1.2 Objective. The primary objective of this program was to quantify the degradation of a HAWK Assault Fire Unit (AFU) performing its air defense maneuvers while dressed in complete chemical protective ensemble (MOPPIV). Field trial measurements included:

a. the ability of AFU team members to perform individual tasks and
b. the overall effectiveness of the unit.

2. APPROACH

2.1 Overview. The measure of degradation for the missile trials was the time difference between performing the task in Battle Dress Uniform (BDU) and MOPPIV. For these trials there were three AFU teams, each required to emplace and march order the five end items listed in Table 1. Emplacement includes such tasks as raising the wheels, leveling the end item, and making the unit operational. March order includes such tasks as lowering the wheels and securing all equipment for road travel. A large part of both emplacement and march order duties is the labor-intensive task of handling power and data cables.

TABLE 1. HAWK Degradation AFU End Items.

End Item	Acronym
Platoon Command	PCP
Continuous Wave Acquisition Radar	CWAR
High Power Illuminator Radar	HIPIR
Launcher	LCHR
Pulse Acquisition Radar	PAR*

*Usually associated with only a battery.

A trained observer was assigned to each end item. He collected the time to complete a task and rated the degradation. Measurements were recorded as elapsed time. Measurements, in minutes for unit accomplishments, such as alignment of the PCP, were recorded by the observer assigned to the PCP.

Individuals were trained in the appropriate MOS and they had previously worked together as an AFU. The crews were familiar with MOPPIV but had received no special training for these trials.

Since these tests were repetitive, individuals gained experience as they progressed through the trials. In an effort to control and later estimate the experience effect, each record was noted on the order of start whether the test was first time in BDU or first time in MOPPIV. For the purposes of this analysis, all references to first-time effect are pertaining to the first iteration, i.e., first trial for each AFU.

Three items of data were available for analysis: first, the time to complete a task, both individual and unit; second, the protective profile (BDU/MOPP), and third, whether it was the first trial or a subsequent one. During the complete test series, a video camera was assigned to each end item and the tasks were recorded as they were being performed. The tasks to be recorded were selected prior to the start of the test series and were recorded for the duration of the trials. These tasks were selected because of an anticipated difficulty or movement modification due to wearing MOPPIV gear. These records of the events will be maintained for reference and future study.

A complete meteorological record was also maintained for each trial. These data are not reported, herein, but for most days, the temperature was 80° ± 10°F with very low humidity.

A multiple linear regression technique was used to estimate the effect of the chemical protective equipment and the effect of practice on the total time to complete the measured tasks.[2]

2.2 Trial Description. The trials were designed to exercise an AFU as a complete air defense unit. Each trial was composed of several iterations with each consisting of the emplacement and march order of the unit. Each trial was designed to perform a maximum number of iterations in the first six hours of the test day. For the complete six-hour session, the members of the AFU performing the test remained in the uniform required for the testing. After the morning session, the AFU members were given an hour lunch break during which time the uniform constraint was lifted. The afternoon session followed and was limited to one or two additional iterations.

These trials were designed to study each end item as a unique group of tasks and to look at the platoon overall efficiency as a group of unit tasks. A short description of each end item, its function, and the tasks performed follows.

2.2.1. Platoon Command Post (PCP). The PCP is the main control center of the HAWK assault firing unit. During an air defense mission, the PCP would control the tracking, selection and firing at the target. For this particular exercise, the Identification Friend or Foe (IFF) antenna

was removed from the roof of the PCP van and placed at a distance of approximately 25 m. This task also required placement of additional cables and an additional alinement task for the PCP crew. Certain tasks, such as removal of the IFF antenna and laying the cable, were labor-intensive; while others, such as end item alinement, require much physical dexterity. Communication was an important requirement for all end items, especially for the PCP because of its central role in the AFU operation.

The PCP timed tasks, which are listed in Table 2, were performed by five Marines. These personnel consisted of three people with the job title, operator, in the 7222 MOS series and two with the title, technician, in the 5920 MOS series. The platoon commander, AFU leader, was part of the PCP crew.

TABLE 2. PCP Timed Tasks and Subtasks.

Task number	Task
1	Emplace the PCP a. ground PCP b. lay cables
2	Emplace IFF Antenna for remote operations
3	Aline IFF to base piece
4	Perform Daily Tactical Display Engagement Control Check (TDECC) on PCP
5	Perform daily IFF checks on PCP
6	Prepare PCP for travel a. stow IFF antenna b. roll and secure cable

2.2.2 Continuous Wave Acquisition Radar (CWAR). The target aircraft as it approaches the HAWK site is detected by the Pulsed Acquisition Radar (PAR) on the site perimeter. After detection, the tracking of the target is "handed off" to the CWAR by the PCP control. The CWAR then tracks the target until the target is within attack distance. The operation of the CWAR requires labor-intensive tasks such as cable handling and physical dexterity tasks such as alinement and electronic module adjustments.

The CWAR tasks listed in Table 3 were performed by three Marines. This group consisted of two operators with an MOS series of 7222 and one technician with an MOS series of 5920.

TABLE 3. CWAR Timed Tasks and Subtasks.

Task number	Task
1	Emplace the CWAR a. ground the CWAR b. level the CWAR
2	Energize the CWAR
3	Perform daily check on the CWAR
4	Orient and aline the CWAR as a base piece
5	Prepare the CWAR for travel a. secure the antenna protective cover b. roll and secure cable

2.2.3 High Power Illumination Radar (HIPIR). After the incoming target aircraft has approached within attacking distance, the target was handed off to the HIPIR for final tracking. Upon launch of the HAWK missile, the target was illuminated by the HIPIR. The reflected radar signal is the homing signal for the launched missile.

The HIPIR operation had the most labor-intensive and physically demanding tasks. The cable handling tasks were increased because there are two additional cables. The leveling and alinement of the HIPIR required that the technician's head be positioned in a small, not easily accessible area, to observe the leveling bubble. This became more difficult while wearing the mask. Monitoring the instrument panels and fine tuning the electronic modules required fine motor movements. Communication was another problem because of the physical layout of the HIPIR chassis. The transmitter and receiver electronics packages were on opposite sides of the chassis, and communication was required between operators at each section during the initial setup and checkout of the electronic systems. The timed tasks of the HIPIR are listed in Table 4.

2.2.4 Launcher-Loader. The launcher section for an AFU has three launcher units with three missiles attached to each. For these trials, only one launcher unit was used with only a single inert missile attached to avoid damage to the costly equipment. An integral part of the launcher section is the loader unit used to transfer the missiles, three at a time, from the missile carriers to the launcher. For these tests, only the one inert missile was transferred.

TABLE 4. HIPIR Timed Tasks and Subtasks.

Task number	Task
1	Emplace HIPIR a. remove and stow antenna protective covers b. level HIPIR
2	Align HIPIR to base piece
3	Prepare the HIPIR for travel a. stow the antenna so that it faces the curb side of the trailer b. secure all air vents and hoods

The operation of the launcher unit required labor-intensive tasks, physically demanding tasks, and communication between team members. This communication problem was particularly important during the missile transfer. The personnel for the unit consisted of eight Marines, i.e., five operators and three technicians. The tasks are listed in Table 5.

2.2.5 Pulsed Acquisition Radar (PAR). Although the PAR is not an end item for an AFU, the unit was included as part of these trails because of the labor-intensive operation of emplacing and march ordering the unit. In normal operation, the PAR would be assigned to a battery and is used for long-range detection of enemy aircraft. The detected aircraft is tracked until close enough to the battery to be handed off to the CWAR by the Battery Command Center (BCC).

The assembly of the PAR unit in MOPPIV gear was a difficult and tedious task. This operation required not only the normal labor-intensive tasks such as laying and gathering cables and making connections but the additional tasks of lifting and handling large and bulky antenna parts. The erection of the antenna required personnel to handle antenna parts atop the antenna unit, which is approximately 5 m above ground level. These tasks required extreme caution by the personnel involved. The timed tasks associated with the PAR are listed in Table 6.

3. FIELD DATA

The recorded times for the individual tasks of each end item are reported in the Appendix. As was stated in the previous section, unit times were recorded by the trained observer assigned to the PCP. These data may be interpreted as a summary of the daily individual tasks and are reported in Tables 7-15.

TABLE 5. Launcher-Loader Timed Tasks and Subtasks.

Task number	Task
1	Emplace Launcher a. level launcher
2	Remove missile from truck mounted storage pallet
3	Align the launcher to the HIPIR
4	Load missile onto launcher a. do launcher preload check b. transfer missile to launcher
5	Perform SATO checks on missile
6	Arm the missile
7	Unload the missile from the launcher a. position launcher boom for unloading b. remove missiles from launcher
8	Prepare the launcher for travel a. remove and stow the stakes

TABLE 6. PAR Time Tasks and Subtasks.

Task number	Task
1	Emplace PAR a. level PAR b. assemble antenna reflector
2	Energize PAR
3	Prepare PAR for travel; disassemble and stow a. omnidirectional antenna b. antenna reflector

TABLE 7. 4 March 85 - BDU, Unit Time Data.

Task	Unit	Iteration Number 1A-1B	1A-2B	1A-3B
		Time, minutes		
Place in operator status	PCP	17.0	0.0	25.0
	CWAR	11.0	13.0	13.0
	HIPIR	12.0	13.0	17.0
	PAR	25.0	0.0	14.0
	LAUNCHER	0.0	0.0	17.0
	IFF	17.0	0.0	25.0
Align vertically		16.0	31.0	19.0
ISC		90.0	45.0	25.0
Fire section operational		20.0	47.0	25.0
March ordered	PCP	16.0	16.0	11.0
	CWAR	18.0	9.0	7.0
	HIPIR	33.0	18.0	14.0
	PAR	17.0	18.0	14.0
	LAUNCHER	20.0	22.0	17.0
	IFF	16.0	15.0	11.0
Unit march ordered		33.0	22.0	17.0

TABLE 8. 5 March 85 - MOPPIV, Unit Time Data.

Task	Unit	Iteration Number 2A-1M	2A-2M	2A-3M	2A-4M	2A-5M
		Time, minutes				
Place in operator status	PCP	18.0	.0	14.0	16.0	11.0
	CWAR	23.0	20.0	10.0	11.0	8.0
	HIPIR	19.0	15.0	14.0	14.0	14.0
	PAR	49.0	22.0	17.0	18.0	15.0
	LAUNCHER	21.0	35.0	14.0	14.0	14.0
	IFF	40.0	11.0	20.0	16.0	16.0
Align vertically		.0	20.0	20.0	16.0	17.0
ISC		.0	37.0	25.0	24.0	26.0
Fire section operational		32.2	30.1	24.2	22.0	25.3
March ordered	PCP	14.0	12.0	11.0	10.0	12.0
	CWAR	9.0	9.0	8.0	7.0	7.0
	HIPIR	22.0	18.0	17.0	18.0	15.0
	PAR	31.0	18.0	19.0	19.0	14.0
	LAUNCHER	20.0	16.0	17.0	15.0	17.0
	IFF	.0	10.0	10.0	7.0	12.0
Unit march ordered		31.0	18.0	19.0	19.0	17.0

TABLE 9. 6 March 85 - MOPPIV, Unit Time Data.

Task	Unit	Iteration Number 3A-1ML	3A-2ML	3A-3ML	3A-4ML	3A-5ML	3A-6ML
		Time, minutes					
Place in operator status	PCP	11.0	11.0	14.0	6.0	5.0	9.0
	CWAR	9.0	7.0	6.0	7.0	7.0	7.0
	HIPIR	13.0	14.0	15.0	13.0	14.0	13.0
	PAR	15.0	14.0	14.0	14.0	9.0	12.0
	LAUNCHER	13.0	13.0	13.0	15.0	15.0	14.0
	IFF	18.0	16.0	16.0	9.0	10.0	10.0
Align vertically		18.0	16.0	17.0	14.0	15.0	18.0
ISC		23.0	24.0	33.0	24.0	30.0	32.0
Fire section operational		24.0	21.8	30.6	23.7	26.8	26.0
March ordered	PCP	10.0	10.0	10.0	9.0	11.0	10.0
	CWAR	7.0	6.0	8.0	8.0	7.0	6.0
	HIPIR	16.0	18.0	16.0	18.0	16.0	15.0
	PAR	12.0	15.0	16.0	14.0	12.0	12.0
	LAUNCHER	17.0	16.0	17.0	14.0	14.0	14.0
	IFF	9.0	10.0	10.0	.0	10.0	9.0
Unit march ordered		17.0	18.0	16.0	18.0	16.0	15.0

TABLE 10. 7 March 85 - MOPPIV, Unit Time Data.

Task	Unit	Iteration Number 1B-1M	1B-2M	1B-3M	1B-4M	1B-5M
		Time, minutes				
Place in operator status	PCP	12.0	7.0	8.0	7.0	7.0
	CWAR	17.0	9.0	7.0	6.0	7.0
	HIPIR	23.0	16.0	12.0	11.0	12.0
	PAR	17.0	16.0	16.0	13.0	17.0
	LAUNCHER	14.0	8.0	11.0	9.0	9.0
	IFF	18.0	14.0	11.0	13.0	13.0
Align vertically		41.0	20.0	15.0	17.0	18.0
ISC		71.0	66.0	40.0	38.0	35.0
Fire section operational		39.0	31.1	23.2	21.2	18.2
March ordered	PCP	18.0	13.0	12.0	14.0	11.0
	CWAR	15.0	9.0	10.0	9.0	7.0
	HIPIR	30.0	26.0	26.0	10.0	22.0
	PAR	23.0	17.0	17.0	16.0	14.0
	LAUNCHER	19.0	12.0	12.0	13.0	12.0
	IFF	17.0	13.0	12.0	12.0	9.0
Unit march ordered		30.0	26.0	26.0	16.0	22.0

TABLE 11. 8 March 85 - BDU, Unit Time Data.

Task	Unit	Iteration Number 2B-1B	2B-2B	2B-3B	2B-4B	2B-5B	2B-6B	2B-7B
		Time, minutes						
Place in operator status	PCP	6.0	6.0	9.0	5.0	4.0	5.0	10.0
	CWAR	6.0	6.0	5.0	4.0	4.0	7.0	10.0
	HIPIR	10.0	10.0	9.0	9.0	6.0	10.0	14.0
	PAR	12.0	11.0	9.0	9.0	12.0	14.0	12.0
	LAUNCHER	9.0	8.0	6.0	5.0	17.0	7.0	9.0
	IFF	9.0	11.0	8.0	8.0	14.0	9.0	13.0
Align vertically		11.0	12.0	10.0	9.0	14.0	16.0	20.0
ISC		25.0	17.0	20.0	158.0	26.0	15.0	16.0
Fire section operational		18.8	13.2	14.7	12.0	23.6	12.0	15.0
March ordered	PCP	9.0	7.0	7.0	6.0	6.0	6.0	6.0
	CWAR	8.0	7.0	4.0	8.0	11.0	7.0	8.0
	HIPIR	18.0	10.0	11.0	13.0	13.0	13.0	16.0
	PAR	11.0	11.0	15.0	11.0	12.0	11.0	11.0
	LAUNCHER	11.0	10.0	7.0	6.0	8.0	5.0	6.0
	IFF	9.0	7.0	.0	6.0	6.0	5.0	.0
Unit march ordered		18.0	11.0	15.0	13.0	13.0	13.0	16.0

TABLE 12. 11 March 85 - MOPPIV, Unit Time Data.

Task	Unit	Iteration Number 3B-1ML	3B-2ML	3B-3ML	3B-4ML	3B-5ML	3B-6ML
		Time, minutes					
Place in operator status	PCP	6.0	8.0	5.0	6.0	6.0	7.0
	CWAR	10.0	10.0	7.0	8.0	10.0	10.0
	HIPIR	15.0	16.0	16.0	16.0	15.0	14.0
	PAR	21.0	8.0	11.0	14.0	.0	.0
	LAUNCHER	9.0	9.0	12.0	9.0	9.0	9.0
	IFF	9.0	9.0	7.0	8.0	8.0	7.0
Align vertically		17.0	17.0	15.0	14.0	16.0	13.0
ISC		42.0	25.0	38.0	25.0	33.0	20.0
Fire section operational		27.7	21.7	19.9	20.8	20.7	17.7
March ordered	PCP	9.0	9.0	8.0	11.0	8.0	9.0
	CWAR	13.0	11.0	10.0	14.0	10.0	8.0
	HIPIR	19.0	20.0	19.0	22.0	16.0	17.0
	PAR	12.0	8.0	11.0	15.0	.0	.0
	LAUNCHER	10.0	10.0	10.0	8.0	9.0	8.0
	IFF	8.0	8.0	8.0	9.0	8.0	9.0
Unit march ordered		19.0	20.0	19.0	22.0	16.0	17.0

TABLE 13. 12 March 85 - MOPPIV, Unit Time Data.

Task	Unit	Iteration Number 1C-1M	1C-2M	1C-3M	1C-4M
		Time, minutes			
Place in operator status	PCP	9.0	13.0	6.0	9.0
	CWAR	11.0	11.0	6.0	7.0
	HIPIR	13.0	14.0	12.0	14.0
	PAR	19.0	15.0	16.0	17.0
	LAUNCHER	16.0	11.0	11.0	11.0
	IFF	23.0	18.0	15.0	14.0
Align vertically		33.0	28.0	17.0	15.0
ISC		130.0	37.0	22.0	21.0
Fire section operational		53.0	32.1	18.0	18.7
March ordered	PCP	19.0	16.0	11.0	17.0
	CWAR	10.0	7.0	4.0	5.0
	HIPIR	18.0	16.0	17.0	16.0
	PAR	15.0	15.0	15.0	15.0
	LAUNCHER	12.0	13.0	6.0	11.0
	IFF	19.0	15.0	11.0	13.0
Unit march ordered		19.0	16.0	17.0	17.0

TABLE 14. 13 March 85 - MOPPIV, Unit Time Data.

Task	Unit	Iteration Number 2C-1ML	2C-2ML	2C-3ML	2C-4ML	2C-5ML
		Time, minutes				
Place in operator status	PCP	7.0	6.0	7.0	8.0	5.0
	CWAR	5.0	5.0	4.0	5.0	4.0
	HIPIR	11.0	14.0	10.0	10.0	11.0
	PAR	16.0	14.0	12.0	14.0	11.0
	LAUNCHER	4.0	5.0	3.0	2.0	8.0
	IFF	13.0	11.0	10.0	14.0	12.0
Align vertically		15.0	15.0	12.0	15.0	13.0
ISC		27.0	24.0	18.0	15.0	23.0
Fire section operational		24.5	18.9	15.9	12.5	18.9
March ordered	PCP	14.0	12.0	12.0	10.0	11.0
	CWAR	5.0	5.0	5.0	5.0	5.0
	HIPIR	15.0	15.0	14.0	13.0	12.0
	PAR	13.0	12.0	12.0	11.0	10.0
	LAUNCHER	4.0	6.0	8.0	9.0	10.0
	IFF	14.0	8.0	12.0	9.0	10.0
Unit march ordered		15.0	15.0	14.0	13.0	12.0

TABLE 15. 14 March 85 - BDU, Unit Time Data.

Task	Unit	Iteration Number 3C-1B	3C-2B	3C-3B	3C-4B	3C-5B
		Time, minutes				
Place in operator status	PCP	7.0	5.0	4.0	5.0	6.0
	CWAR	3.0	3.0	4.0	5.0	4.0
	HIPIR	7.0	9.0	9.0	9.0	9.0
	PAR	12.0	12.0	11.0	12.0	11.0
	LAUNCHER	9.0	8.0	14.0	8.0	6.0
	IFF	11.0	9.0	8.0	9.0	9.0
Align vertically		10.0	13.0	11.0	13.0	11.0
ISC		16.0	15.0	12.0	14.0	12.0
Fire section operational		12.9	12.1	10.7	10.8	9.0
March ordered	PCP	10.0	7.0	8.0	7.0	9.0
	CWAR	4.0	4.0	4.0	5.0	4.0
	HIPIR	15.0	11.0	11.0	14.0	11.0
	PAR	11.0	9.0	11.0	10.0	13.0
	LAUNCHER	7.0	8.0	8.0	9.0	7.0
	IFF	10.0	7.0	8.0	7.0	8.0
Unit march ordered		15.0	11.0	11.0	14.0	11.0

4. DATA ANALYSIS and DISCUSSION

The regression analysis used to analyze the data is the same technique as used in a prior reports.[3,4] A correction factor (CF) is calculated. This CF is used to multiply the time to complete a task in the normal duty uniform to obtain an estimate to complete the task while wearing IPE. This technique provided two values for calculating a CF and a probable range; these are T_o, which is the practiced, unencumbered time and a, the MOPPIV uniform clothing correction. Additionally, training correction b simply removes this effect from the correction factor calculation. The MOPPIV degradation for any particular task is defined as:

$$T_o / (T_o + a).$$

The MOPPIV correction factor is the inverse of this term and can be used to multiply the time to complete a task while wearing BDUs to give an estimate of the time to complete the same task while wearing MOPPIV. A negative a or b indicates that a task was completed in less time by a team wearing MOPPIV or by a less experienced team, respectively. Generally, such results can be attributed to noncorrectable inconsistencies in some team's performance for that task.

4.1 Regression Results for End Item Tasks.

4.1.1 PCP. The PCP tasks require very little MOPPIV correction. The maximum correction of about 1.4 was for the performance of daily checks. This increase might be due to the fact that these checks are performed inside the PCP van where the lighting is poor and the personnel had masks on. Laying and securing the cables was affected minimally by wearing MOPPIV clothing. Table 16 lists the regression analysis results for the PCP tasks.

4.1.2 CWAR. The MOPPIV correction factors for the CWAR end item range from 1.0 to 1.4. The operations of the CWAR appeared to have the lowest CFs. Again, the electronic checks seemed to require the maximum correction factor that might be caused by the manipulation of small electronic switches with the large oversized gloves and reading output meters encumbered by the mask. The results of the regression analysis for the CWAR can be found in Table 17.

4.1.3 HIPIR. The HIPIR and launcher-loader end item tasks showed the greatest effect of the MOPPIV gear. For the HIPIR, the correction factors ranged from a low 1.1 to a high 1.6. The largest effect was seen in the task of leveling the equipment. It was mentioned earlier that this task was difficult because the operator was forced to cram his head and mask into a small area to view the level bubble. Aligning the HIPIR was also affected in the same manner and for the same reasons. The electronic tuning tasks for the HIPIR were not affected as they were in the PCP and CWAR. A list of the regression analysis results is given in Table 18.

4.1.4 Launcher-Loader. The launcher tasks were also affected by wearing MOPPIV protective clothing. The CF ranges were again 1.0 to 1.6. The task of aligning the launcher to the HIPIR again had the maximum correction factors. These CFs could not be separated from the HIPIR. Because the alinement required actions between end items, the increase in time for the launcher might be accredited to the fact that the HIPIR personnel were having difficulties. These interactions cannot be determined by these data. One interesting observation is that all tasks, which involved moving the missile, generally had low CFs. This observation is noteworthy because these tasks required considerable communication between the launcher and loader personnel. The results of the regression analysis for the launcher-loader end item can be found in Table 19.

4.1.5 PAR. When the trials began, most test observers believed that the PAR end item would be most affected by wearing the MOPPIV chemical protective clothing. This did not seem to be true. The correction factors ranged 1.0 to 1.6 which is on the same order as the other end items. The maximum correction factor of 1.6 was for energizing the system but may have occurred because the PAR is not normally associated with the AFU. The operating personnel may have had problems because of a lack of proper communications with the normal control center, the Battery

TABLE 16. Regression Analysis - PCP.

Task	Unencumbered term, T_o	Clothing correction, a	Training correction, b	MOPPIV CF/Range
1	4.29	-0.23 ± 0.30	0.50 ± 0.58	0.95 0.88-1.02
2	0.92	-0.06 ± 0.11	-0.18 ± 0.21	0.93 0.82-1.05
3	2.85	-0.66 ± 0.21	-0.27 ± 0.40	0.77 0.69-0.84
4	9.04	2.36 ± 0.89	9.08 ± 1.72	1.26 1.16-1.36
5	3.52	-0.18 ± 0.88	5.60 ± 1.71	0.95 0.70-1.20
6	2.60	0.94 ± 0.53	1.67 ± 1.03	1.36 1.16-1.57
7	1.67	0.63 ± 0.19	1.37 ± 0.37	1.38 1.26-1.49
8	8.43	2.33 ± 0.72	8.68 ± 1.38	1.28 1.19-1.36
9	7.49	2.60 ± 0.73	8.56 ± 1.39	1.35 1.25-1.44
10	3.70	-0.99 ± 0.58	0.06 ± 1.10	0.73 0.58-0.89

Task 1 - Emplace the PCP
Task 2 - Ground the PCP
Task 3 - Lay cables
Task 4 - Emplace IFF antenna for remote operations
Task 5 - Align IFF to base piece
Task 6 - Perform daily Tactical Display Engagement Control Check (TDECC) on PCP
Task 7 - Perform daily IFF checks on PCP
Task 8 - Prepare PCP for travel
Task 9 - Stow IFF antenna
Task 10 - Roll and secure cable

TABLE 17. Regression Analysis - CWAR.

Task	Unencumbered term, T_o	Clothing correction, a	Training correction, b	MOPPIV CF/Range
1	6.46	2.14 ± 1.12	8.24 ± 2.12	1.33 1.16-1.50
2	0.80	0.13 ± 0.06	0.08 ± 0.12	1.16 1.09-1.24
3	1.31	0.28 ± 0.39	2.91 ± 0.76	1.21 0.92-1.51
4	0.98	0.03 ± 0.02	0.16 ± 0.04	1.03 1.01-1.05
5	2.3[illegible]	0.87 ± 0.37	2.99 ± 0.71	1.37 1.21-1.53
6	2.32	0.45 ± 1.05	1.74 ± 2.04	1.19 0.74-1.65
7	7.17	0.53 ± 0.57	5.05 ± 1.11	1.07 0.99-1.15
8	0.96	-0.02 ± 0.08	1.12 ± 0.15	0.98 0.90-1.06
9	4.57	-0.20 ± 0.26	3.40 ± 0.49	0.96 0.90-1.01

Task 1 - Emplace the CWAR
Task 2 - Ground the CWAR
Task 3 - Level the CWAR
Task 4 - Energize the CWAR
Task 5 - Perform daily check on the CWAR
Task 6 - Orient and align the CWAR as a base piece
Task 7 - Prepare the CWAR for travel
Task 8 - Secure the antenna protective cover
Task 9 - Roll and secure cables

TABLE 18. Regression Analysis - HIPIR.

Task	Unencumbered term, T_o	Clothing correction, a	Training correction, b	MOPPIV CF/Range
1	9.57	4.51 ± 0.61	2.85 ± 1.17	1.47 1.41-1.54
2	0.60	0.31 ± 0.29	0.24 ± 0.52	1.52 1.03-2.00
3	2.43	1.51 ± 0.59	3.79 ± 1.18	1.62 1.38-1.86
4	2.60	1.42 ± 0.60	2.04 ± 1.15	1.55 1.32-1.78
5	10.48	1.13 ± 0.45	0.16 ± 0.79	1.11 1.06-1.15
6	13.39	4.02 ± 1.19	-0.70 ± 2.30	1.30 1.21-1.39
7	3.20	0.62 ± 0.32	-0.57 ± 0.61	1.19 1.09-1.29
8	4.07	0.78 ± 0.49	0.64 ± 0.97	1.19 1.07-1.31

Task 1 - Emplace HIPIR
Task 2 - Remove and stow antenna protective covers
Task 3 - Level HIPIR
Task 4 - Align HIPIR to base piece
Task 5 - Perform daily checks on HIPIR
Task 6 - Prepare the HIPIR for travel
Task 7 - Stow the antenna so that it faces the curb side of the trailer
Task 8 - Secure all air vents and hoods

TABLE 19. Regression Analysis - LAUNCHER.

Task	Unencumbered term, T_o	Clothing correction, a	Training correction, b	MOPPIV CF/Range
1	8.71	3.84 ± 0.92	4.10 ± 1.79	1.44 1.34-1.55
2	3.40	0.40 ± 1.35	-0.10 ± 2.18	1.12 0.72-1.51
3	4.12	0.17 ± 0.58	5.60 ± 0.95	1.04 0.90-1.18
4	2.42	1.43 ± 0.54	3.66 ± 1.22	1.59 1.37-1.81
5	3.14	-0.21 ± 0.32	2.66 ± 0.68	0.93 0.83-1.04
6	3.25	-0.17 ± 0.64	3.59 ± 1.34	0.95 0.75-1.14
7	0.60	-0.18 ± 0.16	0.67 ± 0.32	0.70 0.43-0.97
8	2.34	0.73 ± 0.32	2.15 ± 0.67	1.31 1.18-1.45
9	9.58	3.24 ± 1.27	4.87 ± 2.44	1.34 1.21-1.47
10	5.48	-0.89 ± 0.93	4.47 ± 1.10	0.84 0.67-1.01

Task 1 - Emplace LAUNCHER
Task 2 - Level LAUNCHER
Task 3 - Remove missile from truck mounted storage pallet
Task 4 - Align the LAUNCHER to the HIPIR
Task 5 - Load missile onto LAUNCHER
Task 6 - Perform SATO checks on missile
Task 7 - Arm the missile
Task 8 - Unload the missile from the LAUNCHER
Task 9 - Prepare the LAUNCHER for travel
Task 10 - Remove and stow the stakes

TABLE 20. Regression Analysis - PAR.

Task	Unencumbered term, T_e	Clothing correction, a	Training correction, b	MOPPIV CF/Range
1	10.49	2.24 ± 0.98	5.11 ± 1.88	1.21 1.12-1.31
2	3.10	0.91 ± 0.46	1.93 ± 0.87	1.29 1.15-1.44
3	9.21	2.76 ± 0.91	5.21 ± 1.74	1.30 1.20-1.40
4	1.14	0.72 ± 1.14	1.88 ± 2.17	1.63 0.63-2.63
5	15.51	-2.37 ± 3.07	3.38 ± 3.61	0.85 0.65-1.05
6	7.39	1.30 ± 0.71	3.93 ± 1.52	1.18 1.08-1.27
7	9.34	2.84 ± 1.09	3.63 ± 2.04	1.31 1.19-1.43

Task 1 - Emplace PAR
Task 2 - Level PAR
Task 3 - Assemble antenna reflector
Task 4 - Energize PAR
Task 5 - Prepare PAR for travel
Task 6 - Disassemble and stow omnidirectional antenna
Task 7 - Disassemble and stow antenna reflector

Control Center. The tasks of erecting and disassembling the antenna components were performed without error or injury and with minor degradation due to clothing. Table 20 reports the results of the regression analysis for the PAR end item.

4.2 Regression Results for the AFU. The times for performing unit tasks were also recorded at the PCP by the trained observer at that item. These times are a measure of the efficiency of the AFU to set up and prepare to fire a missile. The results show that the times to make the fire section operational showed the maximum correction factor of 1.5. The results of the regression analysis for the AFU can be found in Table 21.

TABLE 21. Hawk Missile Unit Regression Data.

Task	Unit	Intercept to	Gear, a	Order, b	MOPPIV, CF/Range
Place in operational status	PCP	7.77	0.73 ± 1.33	4.40 ± 2.52	1.1 0.9-1.3
	CWAR	6.17	2.32 ± 1.18	5.28 ± 2.29	1.4 1.2-1.6
	HIPIR	9.97	3.77 ± 0.77	3.52 ± 1.49	1.4 1.3-1.5
	PAR	12.28	3.39 ± 1.92	5.79 ± 3.62	1.3 1.1-1.4
	LAUNCHER	9.29	2.09 ± 1.76	3.62 ± 3.95	1.2 1.0-1.4
	IFF	10.81	2.59 ± 1.76	6.79 ± 3.34	1.2 1.1-1.4
Align vertically		13.23	3.72 ± 1.46	14.29 ± 2.82	1.3 1.2-1.4
Fire section operational		15.84	7.63 ± 2.24	16.41 ± 4.35	1.5 1.3-1.6
March ordered	PCP	8.09	3.13 ± 0.72	7.48 ± 1.39	1.4 1.3-1.5
	CWAR	6.81	0.77 ± 0.77	7.01 ± 1.49	1.1 1.0-1.2
	HIPIR	14.13	2.97 ± 1.18	10.87 ± 2.28	1.2 1.1-1.3
	PAR	12.02	2.45 ± 1.19	4.67 ± 2.29	1.2 1.1-1.3
	LAUNCHER	9.57	2.28 ± 1.29	5.91 ± 2.52	1.2 1.1-1.4
	IFF	8.25	1.94 ± 0.74	7.79 ± 1.34	1.2 1.1-1.3
Unit march ordered		14.91	2.96 ± 1.27	10.47 ± 2.47	1.2 1.1-1.3

4.3 Survey Questions. At the conclusion of each day of testing in MOPPIV clothing, each trial participant was requested to fill in a questionnaire about the problems encountered because of the MOPPIV clothing. The participant was requested to select a numerical value for the problems encountered. The numerical range from 0 to 10, where 0 was no encumbrance and 10 was the incapability to perform a task. Minor problems were valued 1-3 and medium difficulties were expressed by a number of 5. The average value was then used to estimate the level of perceived difficulty due to each factor. The two biggest concerns among those questioned was the perceived heat buildup in the mask. The summarized results of the survey for each end item are reported in Tables 22-26.

TABLE 22. PCP Hawk Missile Question Data (MOPPIV TRIALS).

Factor	Total average, PCP operator	PCP technician	PCP other
Mask/Vision	2.1	1.0	1.4
Mask/Water	4.3	3.0	3.0
Mask/Breathing	3.9	2.6	2.5
Mask/Communicate	3.5	2.0	3.5
Boots/Movement	3.1	1.1	2.5
Boots/Slipping	1.7	1.3	0.3
Glove/Operating Equipment	3.6	4.2	2.5
Gloves/Tasks	4.1	4.2	2.5
Overgarment/Bulk	3.4	2.0	2.3
Overgarment/Heat	5.0	3.0	3.8
Average	3.5	2.4	2.4

TABLE 23. CWAR Hawk Missile Question Data (MOPPIV TRIALS).

Factor	Total average, CWAR operator	CWAR technician	CWAR other
Mask/Vision	3.1	3.4	2.0
Mask/Water	5.3	6.6	5.0
Mask/Breathing	4.3	6.0	3.0
Mask/Communicate	4.3	4.8	3.0
Boots/Movement	3.7	2.8	2.0
Boots/Slipping	3.0	2.2	1.0
Glove/Operating Equipment	4.3	3.6	1.0
Gloves/Tasks	4.5	4.0	1.0
Overgarment/Bulk	3.7	5.4	1.0
Overgarment/Heat	6.2	7.4	2.5
Average	4.2	4.6	2.2

TABLE 24. HIPIR Hawk Missile Question Data (MOPPIV TRIALS).

Factor	Total average, HIPIR operator	HIPIR technician	HIPIR other
Mask/Vision	3.7	2.5	3.0
Mask/Water	5.4	5.9	6.7
Mask/Breathing	4.1	5.8	5.7
Mask/Communicate	4.0	3.4	3.7
Boots/Movement	3.5	3.3	1.3
Boots/Slipping	2.3	2.9	1.2
Glove/Operating Equipment	3.4	4.1	3.0
Gloves/Tasks	3.5	4.5	2.7
Overgarment/Bulk	3.3	3.9	3.5
Overgarment/Heat	5.9	6.9	6.2
Average	3.9	4.3	3.7

TABLE 25. LAUNCHER Hawk Missile Question Data (MOPPIV TRIALS).

Factor	Total average, LCHR operator	LCHR technician	LCHR other
Mask/Vision	2.3	4.2	3.9
Mask/Water	6.0	6.9	5.4
Mask/Breathing	4.8	6.0	4.8
Mask/Communicate	5.6	5.5	4.8
Boots/Movement	4.0	4.2	3.8
Boots/Slipping	3.8	4.1	3.5
Glove/Operating Equipment	3.1	4.9	5.5
Gloves/Tasks	3.8	4.9	3.4
Overgarment/Bulk	4.4	5.5	4.3
Overgarment/Heat	6.4	7.3	6.7
Average	4.4	5.4	4.6

5. SUMMARY AND CONCLUSIONS

The quantification of the degradation of personnel equipped in protective clothing has been determined for a HAWK Assault Fire Unit. The inverse of the degradation is the correction factor and it is reported for all measured unit tasks in Table 27. Also shown in the same table is the probable range of the correction factor. When multiplied by the time to perform the task in Battle Dress Uniform, these factors provide a time estimate and the most probable range of times for performing similar tasks in MOPPIV clothing. These results show very little personnel degradation caused by clothing.

TABLE 26. PAR Hawk Missile Question Data (MOPPIV TRIALS).

Factor	Total average, PAR operator	PAR technician	PAR other
Mask/Vision	3.0	3.6	5.0
Mask/Water	6.4	6.0	1.0
Mask/Breathing	4.3	4.5	7.0
Mask/Communicate	4.6	3.8	2.0
Boots/Movement	5.9	5.5	8.0
Boots/Slipping	3.5	3.9	6.0
Glove/Operating Equipment	6.8	6.1	9.0
Gloves/Tasks	6.7	6.6	9.0
Overgarment/Bulk	3.9	5.6	9.0
Overgarment/Heat	7.4	7.4	8.0
Average	5.3	5.3	6.4

TABLE 27. MOPPIV Correction Factors.

Task	Unit	Factor	Probable Range
Place in operational status	PCP	1.1	0.9-1.3
	CWAR	1.4	1.2-1.6
	HIPIR	1.4	1.3-1.5
	PAR	1.3	1.1-1.4
	LAUNCHER	1.2	1.0-1.4
	IFF	1.2	1.1-1.4
Align vertically		1.3	1.2-1.4
Fire section operational		1.5	1.3-1.6
March ordered	PCP	1.4	1.3-1.5
	CWAR	1.1	1.0-1.2
	HIPIR	1.2	1.1-1.3
	PAR	1.2	1.1-1.3
	LAUNCHER	1.2	1.1-1.4
	IFF	1.2	1.1-1.3
Unit march ordered		1.2	1.1-1.3

6. REFERENCES

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APPENDIX:
FIELD DATA FOR COMPONENT TASKS

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TABLE A-1. 4 March 85 - BDU, PCP Time Data.

Task	Subtask	Iteration Number 1A-1B Time, minutes	1A-2B	1A-3B
Emplace PCP		5.0	3.5	4.2
	Ground PCP	0.8	1.0	1.5
	Lay cables	1.6	2.0	4.0
Emplace IFF		17.4	15.1	8.8
Align IFF		12.0	4.7	5.1
Perform TDECC		5.8	2.4	1.7
Perform IFF dailies		2.0	1.5	1.3
March order PCP		18.0	16.3	11.0
	Stow IFF	15.9	14.0	10.7
	Secure cables	4.0	7.6	7.5

TABLE A-2. 4 March 85 - BDU, CWAR Time Data.

Task	Subtask	Iteration Number 1A-1B Time, minutes	1A-2B	1A-3B
Emplace CWAR		19.4	0.0	12.3
	Ground CWAR	1.2	1.1	1.2
	Level CWAR	1.7	3.9	2.6
Energize CWAR		1.4	1.0	1.0
Perform dailies		6.2	5.5	3.4
Align CWAR		3.7	14.2	2.3
March order CWAR		12.0	8.9	7.0
	Secure antenna cover	2.2	1.8	1.1
	Secure cables	8.9	4.2	3.8

TABLE A-3. 4 March 85 - BDU, HIPIR Time Data.

Task	Subtask	Iteration Number 1A-1B Time, minutes	1A-2B	1A-3B
Emplace HIPIR		11.7	10.0	8.0
	Stow antenna covers	0.3	0.4	0.2
	Level HIPIR	1.8	2.5	3.2
Align HIPIR		4.6	2.9	1.3
Perform dailies		11.5	10.4	9.0
March order HIPIR		16.7	16.8	13.7
	Stow antenna	2.5	2.0	5.0
	Secure vent covers	6.8	6.7	2.4

TABLE A-4. 4 March 85 - BDU, PAR Time Data.

Task	Subtask	Iteration Number 1A-1B Time, minutes	1A-2B	1A-3B
Emplace PAR		20.3	17.2	14.4
	Level PAR	6.4	4.4	2.8
	Assemble antenna reflector	20.3	3.5	11.6
Energize PAR		4.2	1.6	3.5
March order PAR		17.4	17.3	15.2
	Stow omnidirectional antenna	16.2	9.5	8.5
	Stow antenna reflector	10.6	17.0	15.2

TABLE A-5. 4 March 85 - BDU, LAUNCHER Time Data.

Task	Subtask	Iteration Number 1A-1B	1A-2B	1A-3B
		Time, minutes		
Emplace LAUNCHER		14.8	13.4	15.3
	Level LAUNCHER	3.3	3.4	3.4
Unload missile	from pallet	10.8	3.8	5.5
Align LAUNCHER		9.8	5.3	3.2
Load missile	onto LAUNCHER	5.9	4.2	7.1
Perform SATA checks		8.0	8.2	5.2
Arm missile		1.8	1.5	1.7
Unload missile	from LAUNCHER	3.7	3.8	2.8
March order LAUNCHER		19.8	21.0	16.4
	Remove and stow stakes	8.1	8.2	4.6

TABLE A-6. 5 March 85 - MOPPIV, PCP Time Data.

Task	Subtask	Iteration Number 2A-1M	2A-2M	2A-3M	2A-4M	2A-5M
		Time, minutes				
Emplace PCP		0.0	4.5	5.1	2.9	3.5
	Ground PCP	1.0	1.1	1.3	2.0	1.2
	Lay cables	2.5	2.7	2.2	1.8	1.9
Emplace IFF		16.7	12.9	14.9	10.9	1.9
Align IFF		6.7	6.0	4.8	3.5	3.9
Perform TDECC		2.8	2.7	3.4	3.1	3.3
Perform IFF dailies		2.3	2.6	2.5	2.7	2.9
March order PCP		13.3	12.3	12.4	10.6	12.2
	Stow IFF	12.1	10.3	10.8	10.0	12.2
	Secure cables	11.0	5.0	3.0	2.8	3.0

TABLE A-7. 5 March 85 - MOPPIV, CWAR Time Data.

Task	Subtask	Iteration Number 2A-1M	2A-2M	2A-3M	2A-4M	2A-5M
		Time, minutes				
Emplace CWAR		22.2	20.2	10.2	10.0	8.3
	Ground CWAR	1.2	1.3	1.1	0.9	0.8
	Level CWAR	6.4	1.2	1.8	1.2	1.7
Energize CWAR		1.1	1.0	1.0	1.0	1.0
Perform dailies		8.2	3.2	2.9	3.4	2.8
Align CWAR		9.5	19.1	2.5	2.8	1.2
March order CWAR		9.2	9.2	8.7	7.8	7.4
	Secure antenna covers	1.1	1.0	1.0	1.0	1.0
	Secure cables	3.9	4.7	5.3	5.0	3.9

TABLE A-8. 5 March 85 - MOPPIV, HIPIR Time Data.

Task	Subtask	Iteration Number 2A-1M	2A-2M	2A-3M	2A-4M	2A-5M
		Time, minutes				
Emplace HIPIR		15.9	15.1	15.1	14.5	15.3
	Stow antenna covers	0.2	0.1	0.2	6.0	1.1
	Level HIPIR	2.3	2.1	2.8	3.7	2.1
Align HIPIR		1.9	1.7	6.5	5.1	4.9
Perform dailies		11.0	0.0	0.0	0.0	0.0
March order HIPIR		21.7	19.7	18.1	19.4	16.8
	Stow antenna	3.6	2.3	2.0	2.5	2.6
	Secure vent covers	3.6	6.3	5.7	5.8	4.3

TABLE A-9. 5 March 85 - MOPPIV, PAR Time Data.

Task	Subtask	Iteration Number 2A-1M	2A-2M	2A-3M	2A-4M	2A-5M
		Time, minutes				
Emplace PAR		24.0	14.5	13.8	14.2	11.7
	Level PAR	4.2	4.0	5.2	4.2	3.2
	Assemble antenna reflector	20.5	12.5	13.8	13.0	11.0
Energize PAR		24.4	4.2	0.7	0.8	1.3
March order PAR		25.3	15.2	15.9	16.2	11.1
	Stow omnidirectional antenna	13.5	9.0	12.0	10.5	8.0
	Stow antenna reflector	25.3	15.2	15.0	16.0	11.1

TABLE A-10. 5 March 85 - MOPPIV, LAUNCHER Time Data.

Task	Subtask	Iteration Number 2A-1M	2A-2M	2A-3M	2A-4M	2A-5M
		Time, minutes				
Emplace LAUNCHER		21.2	20.5	17.0	15.0	17.3
	Level LAUNCHER	5.9	7.1	2.9	5.2	2.0
Unload missile	from pallet	10.3	5.4	4.6	4.2	4.3
Align LAUNCHER		5.0	3.5	6.7	5.4	6.0
Load missile	onto LAUNCHER	0.0	3.8	3.4	2.8	2.8
Perform SATA checks		0.0	6.5	4.9	3.8	0.0
Arm missile		0.0	1.8	0.4	0.8	0.0
Unload missile	from LAUNCHER	0.0	5.5	2.8	2.8	1.9
March order LAUNCHER		21.5	13.8	20.1	17.8	20.3
	Remove and stow stakes	6.8	5.8	5.2	3.5	3.7

TABLE A-11. 6 March 85 - MOPPIV, PCP Time Data.

Task	Subtask	Iteration Number 3A-1ML	3A-2ML	3A-3ML	3A-4ML	3A-5ML	3A-6ML
		Time, minutes					
Emplace PCP		3.0	2.5	3.6	3.2	3.0	*
	Ground PCP	1.0	.7	1.2	.8	.8	*
	Lay cables	1.7	1.7	2.2	1.9	1.9	*
Emplace IFF		12.1	10.0	12.2	9.7	9.4	*
Align IFF		2.5	4.7	4.1	5.1	3.0	*
Perform TDECC		4.8	2.6	2.7	3.5	3.0	*
Perform IFF dailies		2.9	2.3	2.7	3.7	2.7	*
March order PCP		10.4	9.7	8.8	8.4	10.0	*
	Stow IFF	9.6	9.5	8.6	7.7	9.7	*
	Secure cables	2.2	2.8	2.0	1.5	2.2	*

TABLE A-12. 6 March 85 - MOPPIV, CWAR Time Data.

Task	Subtask	Iteration Number 3A-1ML	3A-2ML	3A-3ML	3A-4ML	3A-5ML	3A-6ML
		Time, minutes					
Emplace CWAR		10.0	7.0	6.8	7.6	7.4	7.1
	Ground CWAR	0.9	1.1	1.0	1.2	1.1	0.8
	Level CWAR	0.8	0.6	0.4	0.5	1.3	1.0
Energize CWAR		1.0	1.0	1.0	1.0	1.0	1.0
Perform dailies		2.4	3.2	2.4	2.4	2.5	2.9
Align CWAR		3.6	1.2	1.5	2.2	1.2	3.2
March order CWAR		7.4	6.5	7.9	7.0	7.1	6.5
	Secure antenna cover	1.0	0.8	0.7	0.9	0.9	0.0
	Secure cables	4.8	3.3	3.9	3.9	4.9	3.3

TABLE A-13. 6 March 85 - MOPPIV, HIPIR Time Data.

Task	Subtask	Iteration Number 3A-1ML	3A-2ML	3A-3ML	3A-4ML	3A-5ML	3A-6ML
		Time, minutes					
Emplace HIPIR		14.2	0.0	15.3	14.5	14.5	*
	Stow antenna covers	0.7	0.0	0.6	0.6	0.4	*
	Level HIPIR	5.9	0.0	5.2	4.8	4.5	*
Align HIPIR		1.9	0.0	2.8	5.4	5.5	*
Perform dailies		12.0	0.0	15.0	12.4	12.4	*
March order HIPIR		17.2	18.2	15.9	18.2	16.5	*
	Stow antenna	3.0	2.5	3.3	3.6	4.3	*
	Secure vent covers	6.0	3.9	3.9	3.1	2.7	*

TABLE A-14. 6 March 85 - MOPPIV, PAR Time Data.

Task	Subtask	Iteration Number 3A-1ML	3A-2ML	3A-3ML	3A-4ML	3A-5ML	3A-6ML
		Time, minutes					
Emplace PAR		12.3	11.2	11.5	10.8	10.2	*
	Level PAR	4.8	4.1	4.0	3.7	3.1	*
	Assemble antenna reflector	11.5	11.2	10.1	10.2	9.6	*
Energize PAR		0.8	1.0	1.4	0.7	0.3	*
March order PAR		9.8	9.9	11.3	10.1	9.2	*
	Stow omnidirectional antenna	7.7	7.0	8.0	7.5	7.8	*
	Stow antenna reflector	9.8	9.7	11.3	10.1	9.2	*

TABLE A-15. 6 March 85 - MOPPIV, LAUNCHER Time Data.

Task	Subtask	Iteration Number 3A-1ML	3A-2ML	3A-3ML	3A-4ML	3A-5ML	3A-6ML
		Time, minutes					
Emplace LCHR		13.4	13.4	12.9	15.4	15.1	*
	Level LCHR	2.3	4.1	4.4	3.7	5.7	*
Unload missile	from pallet	4.7	3.1	3.1	3.0	3.4	*
Align LCHR		6.3	5.9	5.7	5.0	3.4	*
Load missile	onto LCHR	2.4	3.2	0.0	2.9	3.1	*
Perform SATA checks		4.0	3.8	0.0	2.8	2.9	*
Arm missile		0.5	0.5	0.0	1.0	0.6	*
Unload missile	from LCHR	2.6	2.1	0.0	2.2	1.9	*
March order LCHR		18.3	15.4	0.0	14.1	14.6	*
	Remove and stow stakes	4.1	4.3	0.0	4.6	4.2	*

TABLE A-16. 7 March 85 - MOPPIV, PCP Time Data.

Task	Subtask	Iteration Number 1B-1M	1B-2M	1B-3M	1B-4M	1B-5M
		Time, minutes				
Emplace PCP		3.2	4.1	3.8	3.4	4.2
	Ground PCP	0.7	0.8	1.1	0.8	0.8
	Lay cables	3.0	2.0	2.0	2.8	1.8
Emplace IFF		18.2	13.9	11.2	13.2	12.1
Align IFF		12.0	2.4	3.1	1.2	17.2
Perform TDECC		3.5	3.1	4.2	3.3	3.1
Perform IFF dailies		3.4	2.7	2.3	2.9	3.3
March order PCP		16.0	12.1	11.0	13.6	10.4
	Stow IFF	15.3	11.7	11.0	11.3	9.8
	Secure cables	3.0	2.0	2.8	2.8	1.1

TABLE A-17. 7 March 85 - MOPPIV, CWAR Time Data.

Task	Subtask	Iteration Number 1B-1M	1B-2M	1B-3M	1B-4M	1B-5M
		Time, minutes				
Emplace CWAR		17.3	9.0	7.2	6.5	6.9
	Ground CWAR	0.7	0.8	0.4	1.0	0.9
	Level CWAR	2.5	2.6	1.1	.9	1.0
Energize CWAR		1.1	1.0	1.0	1.0	1.0
Perform dailies		8.5	4.3	4.6	3.2	3.4
Align CWAR		7.9	1.8	2.5	1.3	2.0
March order CWAR		12.5	9.4	9.7	9.2	7.3
	Secure antenna covers	2.8	0.8	0.7	0.9	1.0
	Secure cables	7.1	5.0	5.0	5.4	3.8

TABLE A-18. 7 March 85 - MOPPIV, HIPIR Time Data.

Task	Subtask	Iteration Number 1B-1M	1B-2M	1B-3M	1B-4M	1B-5M
		Time, minutes				
Emplace HIPIR		22.0	16.6	12.4	10.9	12.1
	Stow antenna covers	0.4	0.6	0.4	0.9	0.8
	Level HIPIR	16.1	6.6	4.7	6.0	3.6
Align HIPIR		7.7	5.3	2.3	3.3	1.6
Perform dailies		10.9	10.7	10.7	11.0	10.9
March order HIPIR		27.3	25.1	18.5	19.6	21.5
	Stow antenna	2.9	3.7	3.4	5.3	3.9
	Secure vent covers	4.4	6.8	5.3	3.8	4.9

TABLE A-19. 7 March 85 - MOPPIV, PAR Time Data.

Task	Subtask	Iteration Number 1B-1M	1B-2M	1B-3M	1B-4M	1B-5M
		Time, minutes				
Emplace PAR		16.5	13.3	13.0	10.3	12.0
	Level PAR	4.5	4.8	4.8	2.8	4.0
	Assemble antenna reflector	14.0	12.0	11.0	8.8	10.0
Energize PAR		1.3	0.7	0.5	0.5	2.0
March order PAR		18.0	13.8	13.0	12.1	11.5
	Stow omnidirectional antenna	12.0	2.7	6.0	4.5	8.0
	Stow antenna reflector	18.0	13.8	13.0	10.5	11.4

TABLE A-20. 7 March 85 - MOPPIV, LAUNCHER Time Data.

Task	Subtask	Iteration Number 1B-1M	1B-2M	1B-3M	1B-4M	1B-5M
		Time, minutes				
Emplace LAUNCHER		15.3	10.3	12.8	11.0	11.5
	Level LAUNCHER	0.0	0.0	1.2	1.2	0.0
Unload missile	from pallet	11.6	6.7	4.7	4.3	5.4
Align LAUNCHER		3.8	1.9	4.2	1.4	0.8
Load missile	onto LAUNCHER	0.0	5.1	4.4	2.5	3.0
Perform SATA checks		0.0	9.6	4.3	2.6	2.7
Arm missile		0.0	0.7	0.8	0.3	0.4
Unload missile	from LAUNCHER	.0	4.6	3.0	2.9	4.5
March order LAUNCHER		16.7	13.6	12.2	14.3	13.4
	Remove and stow stakes	10.9	4.0	5.4	2.9	4.3

TABLE A-21. 8 March 85 - BDU, PCP Time Data.

Task	Subtask	Iteration Number 2B-1B	2B-2B	2B-3B	2B-4B	2B-5B	2B-6B
		Time, minutes					
Emplace PCP		2.6	3.9	3.1	4.4	5.5	*
	Ground PCP	0.8	0.9	0.9	0.9	0.8	*
	Lay cables	2.8	2.0	2.9	3.9	3.1	*
Emplace IFF		9.2	10.7	7.8	8.6	7.7	*
Align IFF		1.9	2.0	3.0	2.0	3.8	*
Perform TDECC		2.1	2.4	5.5	1.4	1.8	*
Perform IFF dailies		2.5	2.0	.0	2.5	2.0	*
March order PCP		9.0	7.0	6.5	6.6	6.1	*
	Stow IFF	9.0	6.1	6.0	5.6	5.5	*
	Secure cables	1.8	2.0	2.6	5.5	4.5	*

TABLE A-22. 8 March 85 - BDU, CWAR Time Data.

Task	Subtask	Iteration Number 2B-1B	2B-2B	2B-3B	2B-4B	2B-5B	2B-6B
		Time, minutes					
Emplace CWAR		6.5	6.4	5.0	5.3	5.5	6.3
	Ground CWAR	0.5	0.8	0.6	0.6	0.9	1.0
	Level CWAR	0.8	0.6	0.9	1.4	1.1	1.8
Energize CWAR		1.0	1.0	1.0	1.0	0.9	0.9
Perform dailies		3.1	1.8	1.9	1.8	1.8	1.8
Align CWAR		2.3	1.8	1.2	1.4	1.8	1.9
March order CWAR		8.5	7.9	4.5	7.8	11.4	8.7
	Secure antenna cover	1.0	0.7	0.0	0.9	1.0	1.0
	Secure cables	3.9	6.3	3.5	5.5	5.9	5.3

TABLE A-23. 8 March 85 - BDU, HIPIR Time Data.

Task	Subtask	Iteration Number 2B-1B	2B-2B	2B-3B	2B-4B	2B-5B	2B-6B
		Time, minutes					
Emplace HIPIR		9.8	9.2	9.4	9.1	10.8	*
	Stow antenna covers	0.5	0.5	0.8	0.8	0.6	*
	Level HIPIR	2.4	2.2	2.9	3.9	3.0	*
Align HIPIR		2.8	2.7	4.5	1.3	2.9	*
Perform dailies		11.1	11.1	10.3	10.2	9.9	*
March order HIPIR		17.2	9.4	10.9	12.4	12.4	*
	Stow antenna	2.6	2.2	2.2	2.3	2.9	*
	Secure vent covers	2.0	4.4	5.2	3.8	4.5	*

TABLE A-24. 8 March 85 - BDU, PAR Time Data.

Task	Subtask	Iteration Number 2B-1B	2B-2B	2B-3B	2B-4B	2B-5B	2B-6B
		Time, minutes					
Emplace PAR		9.3	6.8	6.8	7.1	8.8	*
	Level PAR	2.6	1.5	2.0	1.6	2.0	*
	Assemble antenna reflector	8.8	6.0	6.8	7.1	8.8	*
Energize PAR		0.6	2.0	0.3	0.7	0.8	*
March order PAR		8.3	7.8	7.0	7.8	9.7	*
	Stow omnidirectional antenna	0.0	5.2	5.3	4.5	5.1	*
	Stow antenna reflector	0.0	7.8	7.0	7.8	9.7	*

TABLE A-25. 8 March 85 - BDU, LAUNCHER Time Data.

Task	Subtask	Iteration Number 2B-1B	2B-2B	2B-3B	2B-4B	2B-5B	2B-6B
		Time, minutes					
Emplace LAUNCHER		9.8	8.4	6.8	6.3	8.3	*
	Level LAUNCHER	0.0	0.0	0.0	0.0	0.0	*
Unload missile	from pallet	5.5	4.5	3.3	2.6	4.7	*
Align LAUNCHER		1.0	1.4	1.7	1.6	1.9	*
Load missile	onto LAUNCHER	3.3	2.5	2.5	2.1	2.3	*
Perform SATA checks		3.0	2.3	2.1	2.1	3.2	*
Arm missile		0.6	0.2	0.3	0.3	0.2	*
Unload missile	from LAUNCHER	2.7	2.4	1.8	1.9	2.9	*
March order LAUNCHER		11.1	9.9	7.1	6.4	8.2	*
	Remove and stow stakes	0.0	0.0	0.0	0.0	0.0	*

TABLE A-26. 11 March 85 - MOPPIV, PCP Time Data.

Task	Subtask	Iteration Number 3B-1ML	3B-2ML	3B-3ML	3B-4ML	3B-5ML	3B-6ML
		Time, minutes					
Emplace PCP		3.8	5.1	4.0	4.5	4.0	*
	Ground PCP	0.8	0.6	0.7	0.7	0.8	*
	Lay cables	2.9	2.8	1.9	2.0	2.2	*
Emplace IFF		9.5	9.6	7.8	7.8	8.6	*
Align IFF		2.4	2.4	3.4	2.7	2.4	*
Perform TDECC		3.4	2.8	2.4	2.4	2.4	*
Perform IFF dailies		2.1	2.4	1.9	1.7	1.7	*
March order PCP		8.3	8.3	8.3	9.2	8.0	*
	Stow IFF	7.7	7.7	7.8	8.6	7.7	*
	Secure cables	2.5	2.7	2.0	0.0	2.1	*

TABLE A-27. 11 March 85 - MOPPIV, CWAR Time Data.

Task	Subtask	Iteration Number 3B-1ML	3B-2ML	3B-3ML	3B-4ML	3B-5ML	3B-6ML
		Time, minutes					
Emplace CWAR		10.5	9.0	7.7	8.4	9.8	8.7
	Ground CWAR	0.9	1.0	0.9	0.9	1.0	0.9
	Level CWAR	1.9	1.2	1.8	1.8	1.0	1.7
Energize CWAR		1.1	1.2	1.0	1.0	1.0	1.0
Perform dailies		2.9	3.1	3.2	3.2	3.0	3.0
Align CWAR		3.0	1.8	2.0	1.9	1.7	1.5
March order CWAR		11.0	9.6	9.4	10.0	8.3	6.9
	Secure antenna cover	1.0	1.0	1.0	0.9	1.0	1.0
	Secure cables	6.1	4.5	0.0	4.8	3.8	4.2

TABLE A-28. 11 March 85 - MOPPIV, HIPIR Time Data.

Task	Subtask	Iteration Number 3B-1ML	3B-2ML	3B-3ML	3B-4ML	3B-5ML	3B-6ML
		Time, minutes					
Emplace HIPIR		15.1	16.2	16.1	16.3	15.9	*
	Stow antenna covers	0.6	0.5	0.5	0.8	0.6	
	Level HIPIR	3.5	3.4	4.6	2.2	4.1	*
Align HIPIR		4.4	2.6	4.4	5.1	4.0	*
Perform dailies		0.0	0.0	0.0	0.0	0.0	*
March order HIPIR		18.4	19.5	18.5	20.0	15.4	*
	Stow antennas	4.6	6.1	3.4	3.6	4.0	*
	Secure vent covers	4.3	4.8	3.3	4.0	3.7	*

TABLE A-29. 11 March 85 - MOPPIV, PAR Time Data.

Task	Subtask	Iteration Number 3B-1ML	3B-2ML	3B-3ML	3B-4ML	3B-5ML	3B-6ML
		Time, minutes					
Emplace PAR		18.0	7.0	10.3	13.0	0.0	*
	Level PAR	11.3	4.0	3.5	4.0	0.0	*
	Assemble antenna reflector	18.0	7.0	10.3	13.0	0.0	*
Energize PAR		1.9	0.8	0.7	0.6	0.0	*
March order PAR		10.3	7.5	10.4	11.5	0.0	*
	Stow omnidirectional antenna	5.0	5.0	4.5	5.0	0.0	*
	Stow antenna reflector	10.3	7.3	10.4	11.5	0.0	*

TABLE A-30. 11 March 85 - MOPPIV, LAUNCHER Time Data.

Task	Subtask	Iteration Number 3B-1ML	3B-2ML	3B-3ML	3B-4ML	3B-5ML	3B-6ML
		Time, minutes					
Emplace LCHR		10.5	10.1	12.1	10.0	9.9	*
	Level LCHR	0.0	0.0	0.0	0.0	0.0	*
Unload missile	from pallet	3.7	3.4	3.5	3.5	3.6	*
Align LCHR		3.2	2.4	3.6	2.2	2.5	*
Load missile	onto LCHR	2.5	2.6	2.7	2.3	2.4	*
Perform SATA chks		3.0	2.0	2.9	1.7	1.7	*
Arm missile		.2	.2	.2	.2	.2	*
Unload missile	from LCHR	2.7	2.6	2.2	2.4	2.0	*
March order LCHR		10.7	10.5	10.?	8.6	9.0	*
	Remove and stow stakes	0.0	0.0	0.0	0.0	0.0	*

TABLE A-31. 12 March 85 - MOPPIV, PCP Time Data.

Task	Subtask	Iteration Number 1C-1M	1C-2M	1C-3M	1C-4M
		Time, minutes			
Emplace PCP		5.7	5.8	4.6	2.9
	Ground PCP	0.6	0.6	0.0	0.6
	Lay cables	1.8	1.9	2.0	1.9
Emplace IFF		23.5	18.3	15.8	14.5
Align IFF		3.0	2.6	1.2	1.2
Perform TDECC		5.4	12.8	2.7	5.4
Perform IFF dailies		5.0	2.3	1.7	1.2
March order PCP		22.0	16.2	11.0	12.7
	Stow IFF	22.0	15.0	11.0	12.5
	Secure cables	2.3	2.0	3.0	2.6

TABLE A-32. 12 March 85 - MOPPIV, CWAR Time Data.

Task	Subtask	Iteration Number 1C-1M	1C-2M	1C-3M	1C-4M
		Time, minutes			
Emplace CWAR		11.7	11.3	6.9	7.4
	Ground CWAR	1.0	0.9	0.9	0.6
	Level CWAR	9.0	1.6	1.9	1.6
Energize CWAR		1.0	1.2	1.0	1.0
Perform dailies		3.0	2.9	3.0	2.8
Align CWAR		1.5	1.9	1.8	1.9
March order CWAR		13.2	7.4	4.8	5.4
	Secure antenna covers	1.2	1.0	0.9	0.9
	Secure cables	7.5	5.3	3.5	4.2

TABLE A-33. 12 March 85 - MOPPIV, HIPIR Time Data.

Task	Subtask	Iteration Number 1C-1M	1C-2M	1C-3M	1C-4M
		Time, minutes			
Emplace HIPIR		12.6	14.3	12.0	14.0
	Stow antenna covers	1.0	1.2	0.8	1.0
	Level HIPIR	3.8	5.3	3.8	1.0
Align HIPIR		4.5	13.5	3.3	2.4
Perform dailies		0.0	0.0	0.0	0.0
March order HIPIR		2.1	16.1	16.8	16.0
	Stow antenna	3.7	4.8	4.3	3.8
	Secure vent covers	4.5	7.3	3.7	3.4

TABLE A-34. 12 March 85 - MOPPIV, PAR Time Data.

Task	Subtask	Iteration Number 1C-1M	1C-2M	1C-3M	1C-4M
		Time, minutes			
Emplace PAR		14.5	14.0	14.8	17.0
	Level PAR	6.0	3.0	2.3	5.0
	Assemble antenna reflector	14.5	14.0	14.0	17.0
Energize PAR		5.0	1.2	1.0	0.3
March order PAR		16.0	14.0	14.3	13.8
	Stow omnidirectional antenna	5.0	5.0	11.5	7.0
	Stow antenna reflector	16.0	14.0	14.3	13.8

TABLE A-35. 12 March 85 - MOPPIV, LAUNCHER Time Data.

Task	Subtask	Iteration Number 1C-1M	1C-2M	1C-3M	1C-4M
		Time, minutes			
Emplace LAUNCHER		16.0	11.3	11.4	11.3
	Level LAUNCHER	0.0	0.0	0.0	0.0
Unload missile	from pallet	7.1	5.3	4.0	4.9
Align LAUNCHER		0.0	0.0	1.1	0.0
Load missile	onto LAUNCHER	5.5	3.4	3.4	2.6
Perform SATA checks		5.5	4.2	2.2	2.6
Arm missile		0.5	0.2	0.2	0.2
Unload missile	from LAUNCHER	6.0	5.1	3.8	3.5
March order LAUNCHER		13.3	13.0	10.0	9.3
	Remove and stow stakes	0.0	0.0	0.0	0.0

TABLE A-36. 13 March 85 - MOPPIV, PCP Time Data.

Task	Subtask	Iteration Number 2C-1ML	2C-2ML	2C-3ML	2C-4ML	2C-5ML
		Time, minutes				
Emplace PCP		4.9	0.0	5.0	4.9	5.0
	Ground PCP	0.6	0.6	0.6	0.6	0.6
	Lay cables	1.8	2.1	2.0	2.0	2.0
Emplace IFF		12.6	11.3	11.0	13.8	10.8
Align IFF		2.1	1.7	1.8	1.5	1.6
Perform TDECC		3.2	2.8	2.6	4.6	2.5
Perform IFF dailies		1.8	1.7	1.5	1.4	1.4
March order PCP		13.3	12.1	12.1	10.1	10.3
	Stow IFF	13.3	8.5	12.1	8.7	9.5
	Secure cables	2.7	2.1	2.0	2.4	1.8

TABLE A-37. 13 March 85 - MOPPIV, CWAR Time Data.

Task	Subtask	Iteration Number 2C-1ML	2C-2ML	2C-3ML	2C-4ML	2C-5ML
		Time, minutes				
Emplace CWAR		6.4	6.4	5.3	5.4	4.6
	Ground CWAR	0.8	1.0	1.0	1.0	0.9
	Level CWAR	1.2	1.3	1.2	1.4	1.4
Energize CWAR		1.0	1.0	1.0	1.0	1.0
Perform dailies		3.2	2.9	2.9	3.0	2.8
Align CWAR		1.5	1.2	1.4	1.8	1.2
March order CWAR		5.9	6.4	6.3	6.1	5.2
	Secure antenna cover	1.0	1.0	.9	1.0	1.0
	Secure cables	4.4	4.4	3.7	4.8	3.2

TABLE A-38. 13 March 85 - MOPPIV, HIPIR Time Data.

Task	Subtask	Iteration Number 2C-1ML	2C-2ML	2C-3ML	2C-4ML	2C-5ML
		Time, minutes				
Emplace HIPIR		11.6	15.1	10.2	10.4	12.2
	Stow antenna covers	1.2	1.2	1.0	0.9	1.1
	Level HIPIR	2.9	2.8	2.9	2.8	6.1
Align HIPIR		3.0	3.2	4.0	3.1	5.8
Perform dailies		0.0	0.0	0.0	0.0	0.0
March order HIPIR		15.0	16.5	13.8	12.9	12.1
	Stow antenna	4.1	5.1	3.5	3.3	5.5
	Secure vent covers	3.0	5.7	11.3	4.6	4.6

TABLE A-39. 13 March 85 - MOPPIV, PAR Time Data.

Task	Subtask	Iteration Number 2C-1ML	2C-2ML	2C-3ML	2C-4ML	2C-5ML
		Time, minutes				
Emplace PAR		14.5	13.7	11.5	13.0	10.0
	Level PAR	2.7	3.7	3.0	4.0	2.9
	Assemble antenna reflector	14.5	13.7	11.5	13.0	9.5
Energize PAR		1.3	1.0	1.3	.8	1.0
March order PAR		11.5	11.2	11.5	9.5	10.8
	Stow omnidirectional antenna	8.0	7.8	6.8	7.0	6.0
	Stow antenna reflector	11.5	11.2	11.5	9.5	10.8

TABLE A-40. 13 March 85 - MOPPIV, LAUNCHER Time Data.

Task	Subtask	Iteration Number 2C-1ML	2C-2ML	2C-3ML	2C-4ML	2C-5ML
		Time, minutes				
Emplace LAUNCHER		10.6	10.3	11.1	9.4	8.0
	Level LCHR	0.0	0.0	0.0	0.0	0.0
Unload missile	from pallet	4.5	3.4	5.4	4.2	4.0
Align LAUNCHER		0.0	0.0	0.0	0.0	0.0
Load missile	onto LCHR	2.4	3.1	2.6	2.7	2.3
Perform SATA checks		2.1	2.0	1.9	1.6	1.1
Arm missile		0.2	0.2	0.1	0.1	0.1
Unload missile	from LCHR	2.7	2.6	4.5	3.3	2.8
March order LAUNCHER		0.0	10.7	7.7	9.3	9.2
	Remove and stow stakes	0.0	0.0	0.0	0.0	0.0

TABLE A-41. 14 March 85 - BDU, PCP Time Data.

Task	Subtask	Iteration Number 3C-1B	3C-2B	3C-3B	3C-4B	3C-5B
		Time, minutes				
Emplace PCP		5.0	4.3	4.2	3.5	3.3
	Ground PCP	0.5	0.6	0.5	0.5	0.6
	Lay cables	2.0	2.3	2.1	2.2	2.0
Emplace IFF		10.6	9.4	8.4	9.3	8.9
Align IFF		2.0	1.3	1.7	1.9	1.9
Perform TDECC		3.8	2.9	2.4	2.7	2.8
Perform IFF dailies		1.8	1.1	1.7	1.3	1.7
March order PCP		10.0	7.9	8.1	7.0	9.0
	Stow IFF	9.5	7.5	7.9	6.7	8.7
	Secure cables	2.1	2.0	2.4	2.1	2.0

TABLE A-42. 14 March 85 - BDU, CWAR Time Data.

Task	Subtask	Iteration Number 3C-1B	3C-2B	3C-3B	3C-4B	3C-5B
		Time, minutes				
Emplace CWAR		3.5	3.5	4.7	5.2	4.2
	Ground CWAR	0.9	0.7	0.5	0.5	0.5
	Level CWAR	1.2	1.2	1.2	1.3	1.2
Energize CWAR		1.0	0.9	0.9	0.9	1.0
Perform dailies		2.0	1.9	1.8	2.0	1.7
Align CWAR		1.1	1.2	1.2	1.2	1.2
March order CWAR		5.1	4.7	4.1	5.3	4.2
	Secure antenna cover	0.7	0.6	0.8	0.8	1.0
	Secure cables	3.5	3.6	3.4	4.4	3.9

TABLE A-43. 14 March 85 - BDU, HIPIR Time Data.

Task	Subtask	Iteration Number 3C-1B	3C-2B	3C-3B	3C-4B	3C-5B
		Time, minutes				
Emplace HIPIR		7.8	8.7	9.3	9.5	9.3
	Stow antenna covers	1.0	0.9	0.8	1.0	1.0
	Level HIPIR	2.5	2.9	2.7	2.1	3.2
Align HIPIR		2.8	2.1	2.4	2.9	3.8
Perform dailies		0.0	0.0	0.0	0.0	0.0
March order HIPIR		10.8	11.4	10.8	14.2	10.8
	Stow antenna	5.5	3.1	5.5	3.1	4.0
	Secure vent covers	3.1	2.5	4.4	2.8	4.7

TABLE A-44. 14 March 85 - BDU, PAR Time Data.

Task	Subtask	Iteration Number 3C-1B	3C-2B	3C-3B	3C-4B	3C-5B
		Time, minutes				
Emplace PAR		11.0	10.0	9.8	11.5	9.0
	Level PAR	3.8	4.0	3.8	5.0	3.5
	Assemble antenna reflector	11.0	10.0	9.8	11.0	9.0
Energize PAR		1.5	2.2	0.8	0.4	0.6
March order PAR		10.6	9.2	9.0	8.4	11.7
	Stow omnidirectional antenna	8.3	6.0	7.0	5.0	5.0
	Stow antenna reflector	10.6	9.2	9.0	8.4	11.7

TABLE A-45. 14 March 85 - BDU, LAUNCHER Time Data.

Task	Subtask	Iteration Number 3C-1B	3C-2B	3C-3B	3C-4B	3C-5B
		Time, minutes				
Emplace LAUNCHER	Level LAUNCHER	8.1	7.5	7.8	8.1	5.9
	from pallet	0.0	0.0	0.0	0.0	0.0
Unload missile		3.2	0.0	0.0	0.0	0.0
Align LAUNCHER		.0	1.8	1.7	1.1	0.0
Load missile	onto LAUNCHER	2.4	0.0	0.0	0.0	0.0
Perform SATA checks		1.3	0.0	0.0	0.0	0.0
Arm missile		0.2	0.0	0.0	0.0	0.0
Unload missile	from LAUNCHER	2.0	0.0	0.0	0.0	0.0
March order LCHR		6.9	7.0	7.3	8.4	5.5

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